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TESTING DIMETHOATE ON NANTUCKET PINE TIP MOTH, *RHYACIONIA FRUSTRANA* (COMSTOCK) TO PERMIT NORMAL HEIGHT GROWTH OF PITCH PINE *PINUS RIGIDA* MILL

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PARKER SNOWDEN
DIVISION OF FOREST PEST CONTROL
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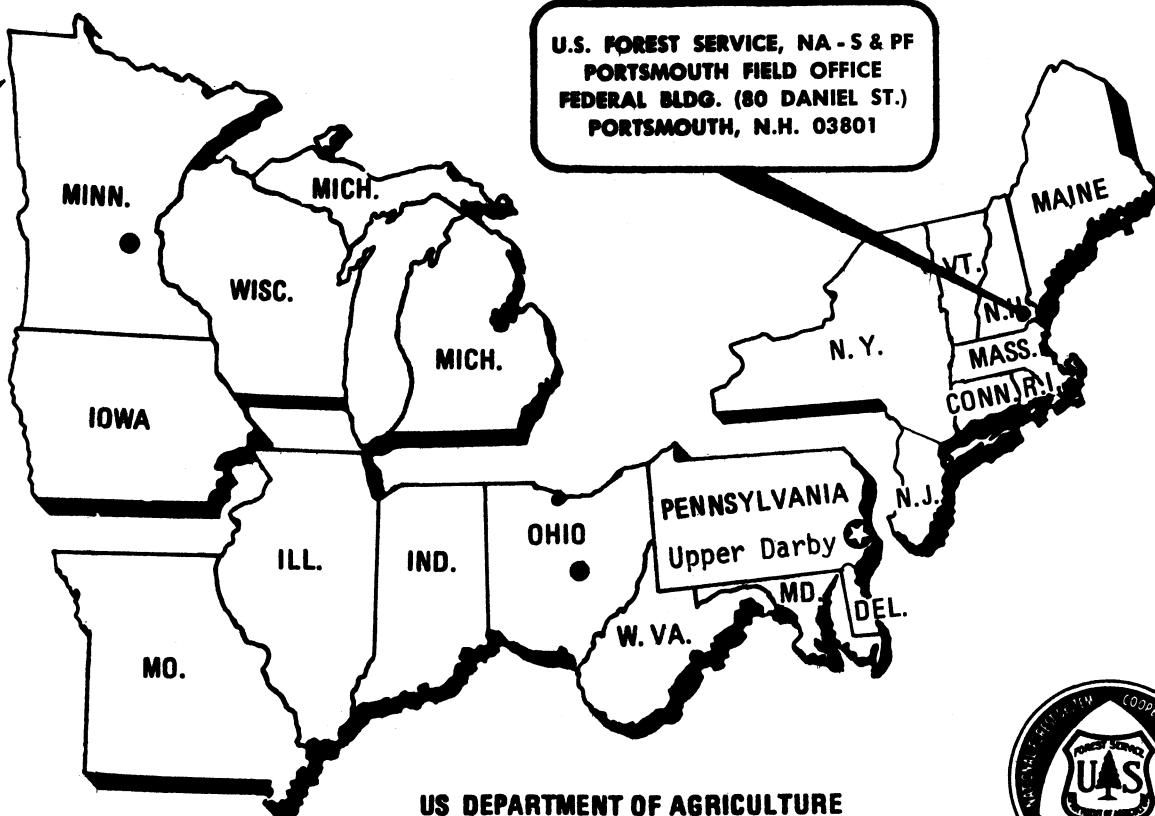
~~Vandenburg~~

~~Boon~~
~~Padgett~~
~~Pierce~~

Glaccio

Geo

Block



U.S. FOREST SERVICE, NA-S & PF
PORTSMOUTH FIELD OFFICE
FEDERAL BLDG. (80 DANIEL ST.)
PORTSMOUTH, N.H. 03801

US DEPARTMENT OF AGRICULTURE
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TESTING DIMETHOATE ON NANTUCKET
PINE TIP MOTH, RHYACIONIA FRUSTRANA (COMSTOCK),
TO PERMIT NORMAL HEIGHT GROWTH OF PITCH PINE,
PINUS RIGIDA MILL

BY
PARKER SNOWDEN
DIVISION OF FOREST PEST CONTROL

ABSTRACT

A test was conducted using dimethoate to control the Nantucket pine tip^{moth} in the adult and early larval stages for the purpose of permitting normal terminal growth of pitch pine Pinus rigida Mill at Fort Dix, New Jersey.

One application of 23.4% Dimethoate E.C. (Cygon) was applied in a mist blower at the rate of 2 tablespoons of actual ingredient to 3 gallons of water.

A single application of Dimethoate significantly increased terminal height growth of these pitch pine plantations.

Although one application was applied during peak emergence of adult moths, it did not reduce the incidence of attack following pupation of the second generation.

INTRODUCTION

At the request of Mr. Joseph Haug, Management Agronomist, Fort Dix, New Jersey, a test of dimethoate was initiated to increase terminal height growth of pitch pine (Pinus rigida) by protecting it from tip damage caused by the Nantucket pine tip moth, Rhyacionia frustrana.

Relatively satisfactory field results (no data recorded) obtained with lindane emulsifiable concentrate suggested that these trees would respond with greater height growth if released from repeated infestations of the Nantucket pine tip moth.

Dimethoate was selected because it has shown promise of reducing tip moth damage. It has also shown to have fewer undesirable effects on the environment than other materials used in the past. This insecticide and the method of application is registered for use against the tip moth.

PURPOSE AND SCOPE

The purpose of this pilot test was an attempt to suppress further tip damage by first generation tip moth in order that normal terminal growth could become established.

The test was conducted in May, 1970 on six plantations (approximately 58 acres) on Fort Dix, New Jersey, where tip moth is a perennial problem. Three plantations totaling 42 acres were sprayed with dimethoate. Three untreated plantations totalling 16 acres served as a check. Refer to Table I.

The planning and testing of dimethoate on Nantucket pine tip moth on the reservation was a cooperative study between U.S. Forest Service and the Department of the Army.

PRE-SUPPRESSION SURVEY

On April 1, 1970, three weeks prior to treatment, each plantation was marked off in square blocks of one-tenth acre. There were approximately 100 trees per block in each plantation. Differences in number of trees in each block were due to planting and tree survival irregularities.

Percentage of infested terminals in each block was determined by visual examination, and recorded. Refer to Table II.

The tree height was measured to the nearest 1/10 foot for each pine tree in each of the blocks. A total of 600 trees were measured. Last year's terminal growth lengths were measured to the nearest tenth of a foot and recorded for each block.

This test was aimed at the first generation moths and first instar larvae. The purpose of spraying at this specific time was to reduce the moth population, and at the same time, take advantage of any systemic action that dimethoate might have on the newly emerged larvae. To do this, it was necessary to accurately determine the peak emergence of these insects from the terminal shoots. This was achieved with 54 bags made of nylon mesh screen which enclosed the terminal tips of individual trees to capture emerging adults. The peak emergence was reached April 29th.

TREATMENT OF PLANTATION

Spraying began on the first plantation at dawn (6:30 a.m.) May 1, 1970. The morning was overcast with heavy mist. Relative humidity was 95%, and the air temperature was 55F. No air velocity reading occurred on the anemometer. Although this did not appear to be an ideal day to spray at Fort Dix, mornings similar to this, were common at this time of the year.

Three plantations were sprayed with dimethoate e.c. Dimethoate (Cygon or Rogor) was formulated as a 23.4% emulsifiable concentrate, i.e., 2 lbs of active insecticide to one gallon of solvent. It was diluted to 2 tablespoons of dimethoate in 3 gallons of water and thoroughly mixed in a metal container. Then it was poured in the mist blower, backpack type, Solo Senior Model 423. The horizontal distance covered by this mist blower was approximately 25 feet. With a diffuser nozzle attached to the mist blower, a swath width of 6 feet was covered. The insecticide was applied to the upper foliage of the trees, especially the terminals.

Areas 1, 4 and 6, which consisted of 42 acres, were sprayed on the same day. It took twelve and a half hours to spray these areas.

The amount of dimethoate e.c. used per acre was as follows:

<u>Area</u>	<u>Quantity of Emulsifiable Conc./Acre</u>
1	3.14 oz
4	2.4 oz
6	2.0 oz

Mean quantity of dimethoate per acre was 2.52 ounces active ingredient. The total amount of insecticide was 0.75 gallons. Cygon was purchased from a local garden nursery at a cost of \$21.95 a gallon.

POST-SUPPRESSION SURVEY

On October 2, 1970 (after the growing season), terminal growth was re-measured and recorded to the nearest tenth of a foot in the sprayed and check plantations to determine effectiveness of the treatment. (See Table III) .

ANALYSIS OF DATA

A Chi-Square (χ^2) test indicated no significant difference between the number of infested tips in the treated plantations and the untreated plantations after spraying at 0.010 probability level. The computed value of Chi-Square was 2.968 (one degree of freedom) at the 1% level of confidence.

In measuring terminal growth of trees after the growing season, there was a significant difference between the three (3) treated plantations and the three (3) untreated plantations (Table IV). The T test (unpaired) for the standard error of the differences between means was used to test for significant 1970 terminal growth (terminal elongation) differences between the treated and untreated plantation. The computed value of the T test was 4.77 (table value=1.960) which was highly significant at the 1% level with 636 d.f.*

RESULTS

Results indicated that the trees in the treated plantations averaged 3.37 inches greater in height than the trees in the check plantations. The treated trees attained average terminal growth of 10.6 inches as opposed to terminal growth of only 7.3 inches on the untreated trees. Whether or not this added increase in terminal growth due to treatment is satisfactory for management objectives is a decision for the land manager to make.

CONCLUSIONS AND RECOMMENDATIONS

Under the conditions of this test:

1. A single application of dimethoate did appreciably increase terminal height growth of pitch pine plantations infested with Nantucket pine tip moth.

* Data compiled in calculation of these tests will be kept on file at the Portsmouth F.O. US Forest Service, Portsmouth, N.H.

2. A single application of dimethoate applied at the time of peak emergence of moths did not reduce the incidence of attack caused by the second generation of Nantucket pine tip moth.

As the tip moth produces two generations per year in Fort Dix, New Jersey area, consideration might be given to a second application of dimethoate to suppress the second generation.

In that several species of insects, such as pine webworm, Tetralopha robustella, Dioryctria spp., and related species of Rhyacionia, were found in association with the Nantucket Pine tip moth, Rhyacionia frustrana, two applications might also suppress the populations of these moths.

TABLE I
SUMMARY TABLE OF THE PLANTATIONS
DESCRIPTION DIMETHOATE PILOT TEST
FORT DIX, N.J. 1970

PLANTATION NO.	MAJOR SPECIES OF TREES	DATE PLANTED	APPROX. ACRES	TREATMENT
1. Observation 11	White Pine - 20% Pitch Pine - 80%	1962	7	Sprayed
2. Area 10	Pitch Pine -90% Black Locust-1%	1962	9	Check
3. Hanover Lake	Pitch Pine - 100%	1962	5	Check
4. Range Rd.	Pitch Pine - 100%	1963 (15 acres) 1962 (15 acres)	30	Sprayed
5. Time Sq. 1	Pitch Pine - 100%	1968	2	Check
6. Time Sq. 2	Pitch Pine - 100%	1967	5	Sprayed

TABLE II

PRE-SUPPRESSION SURVEY

TERMINAL DAMAGE BY NANTUCKET PINE TIP MOTH ON PITCH PINE PRIOR TO TREATMENT - APRIL 1970

BASED ON 100 TIPS EXAMINED/BLOCK

<u>TREATED</u>				<u>CHECK</u>			
<u>Area No.</u>	<u>Infested Tips</u>	<u>Uninfested Tips</u>	<u>Total No. of Tips</u>	<u>Area No.</u>	<u>Infested Tips</u>	<u>Uninfested Tips</u>	<u>Total No. of Tips</u>
1	90	10	100	2	98	2	100
4	88	12	100	3	90	10	100
6	49	51	100	5	51	49	100
TOTALS	<u>227</u>	<u>73</u>	<u>300</u>	TOTALS	<u>239</u>	<u>61</u>	<u>300</u>

Percent Tips Infested 75.6%

Percent Tips Infested 79.6%

TABLE III

POST-SUPPRESSION SURVEY

TERMINAL DAMAGE BY NANTUCKET PINE TIP MOTH ON PITCH PINE AFTER TREATMENT - OCTOBER 2, 1970

BASED ON 100 TIPS EXAMINED/BLOCK

<u>TREATED</u>				<u>CHECK</u>			
<u>Area No</u>	<u>Infested Tips</u>	<u>Uninfested Tips</u>	<u>Total No. of Tips</u>	<u>Area No.</u>	<u>Infested Tips</u>	<u>Uninfested Tips</u>	<u>Total No. of Tips</u>
1	85	15	100	2	100	0	100
4	92	8	100	3	70	30	100
6	22	78	100	5	55	45	100
TOTALS	<u>199</u>	<u>91</u>	<u>300</u>	TOTALS	<u>255</u>	<u>75</u>	<u>300</u>

Percent Tips Infested =66%

Percent Tips Infested =85%

TABLE IV
AVERAGE TERMINAL GROWTH OF TREATED AND UNTREATED PLANTATIONS PRIOR AND
AFTER SPRAYING WITH DIMEOTHOATE
FORT DIX, N.J. - 1970

TREATED					UNTREATED				
Area	Terminal Growth Be- fore treat- ment - Feet	Terminal Growth Af- ter treat- ment-Feet	In- crease	De- crease	Area	Terminal Growth Be- fore treat- ment-Feet	Terminal Growth Af- ter treat- ment-Feet	In- crease Feet	De- crease Feet
1	0.25	1.23	0.98	-	2	0.46	0.55	0.09	-
4	0.71	1.17	0.46	-	3	0.69	1.10	0.41	-
6	0.20	0.24	0.04	-	5	0.21	0.17		0.04

Av. Terminal Growth Pre-Treatment=0.39' or 4.7"
 Av. Terminal Growth Post Treatment=.88' or 10.6"
 Av. Increase = .49' (5.8")

Av. Terminal Growth Pre-Treatment=.45' or 5.40"
 Av. Terminal Growth Post Treatment=.61' or 7.32"
 Av. Increase = .16' (1.9")

FORT DIX MILITARY RESERVATION

